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for a certain period, followed by a brief pause before the performance is repeated. The notes of the members of the particular colony located near Spring Hill appeared to be rather louder than the notes of some individuals of this species which I have heard elsewhere.

On the evening of August 21, I again visited this colony, the individuals of which were just beginning their usual nocturnal stridulations. While listening to their rather harsh, unmusical phrases, a loud, musical chirping started up, low down in the herbage and underbrush nearby. It was similar to the chirping notes of a cricket, and possessed the true tonal quality characteristic of the notes of such crickets as are found in the genera, *Gryllus*, *Ecanthus*, or *Orocharis*. I was actually somewhat startled by the loud, unfamiliar chirping, for I could not think of any species of cricket in this locality which I had not determined. After a careful search with a pocket flashlight, I located the musician, which, much to my surprise, proved to be the cone-headed grasshopper (*N. Exiliscanorus*). With the exception of the acquired cricket-like, musical pitch or tonal quality, the notes were delivered in a manner typically characteristic of this cone-headed grasshopper. I captured the insect and compared its tegmina with the tegmina of individuals stridulating in the normal manner, but could determine no particular differences in the stridulating field or the stridulating veins. A microscopic examination of the character of the teeth of the stridulating vein revealed nothing which could be considered responsible for the unusual character of stridulation.

It has always been a mystery to me why the crickets as a class produce stridulations characterized by the musical qualities of pitch and timbre, while the majority of the musical Orthoptera produced only lisping or harsh, strident, unmusical sounds such as are characteristic of the species of *Conocephalus*, *Orchelimum*, *Neoconocephalus*, *Atlanticus*, *Amblycorypha*, *Pterophylla*, etc. The question of the origin and evolution of the musical impulse as a dominant feature in the development of the Orthoptera must ever excite the

mind to wonder. In this class of insects, sound has become an almost constant and irrepressible feature of their lives. How did the tonal quality become acquired and why is it so constantly associated with the crickets? It is evident that this more musical quality may arise suddenly in the individuals of a species which normally produce only "noise," so to speak, as in the case of the cone-headed grasshopper mentioned. If such a change were associated with the germinal constitution so that it became a transmissible feature and not a merely accidental or temporary individual feature, it would suggest how a musical, cricket-like chirp could arise from a mere rasping note or "noise," and persist as a racial feature. If this were true, the sudden acquirement of the character would be in the nature of a mutation or discontinuous variation, and it is possible that evolutionary steps of this sort have actually occurred in the specialized development of stridulatory powers among the Orthoptera.

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SCIENTIFIC BOOKS

Field Book of Insects. With Special Reference to those of Northeastern United States. Aiming to Answer Common Questions. By FRANK E. LUTZ, PhD. G. P. Putnam's Sons. ix+509 pp. 101 plates.

The text-books dealing with American insects are all excellent but are comprehensive and prepared for the use of students and advanced workers. None of them, however, cover just the field of the present volume. In European countries, where there are many more persons interested in the collection and study of insects than in America, a large number of small well-illustrated volumes are available, where the collector can identify his specimens as well as obtain information regarding their habits. These volumes are of such size that they can be slipped in the pocket and taken into the field for ready reference. There are "Field Books" dealing with American plants and birds, but this is the first one dealing with insects.

Although the "Field Book of Insects" covers a large field, it is convenient in size, 7 x 4½ x 1 inches, weighs about sixteen ounces, and while printed from small type, the printing is well spaced, clear and easily read. There are 101 plates, of which twenty-four are colored. The plates contain 800 figures, which are well drawn and will be of great aid in the identification of specimens. While the majority of the figures are of adult insects, there are many of nymphs, larvæ and pupæ, illustrating the common and peculiar types.

In the choice of the species to be described and figured, the author has evidently made use of his museum experience. The selection is excellent and includes all the common and anomalous species most likely to be met with by the amateur and general collector in the region covered, the northeastern United States. The discussions are interesting and concise. The introduction includes a general discussion on the number of kinds of insects, the scientific names of animals, growth and metamorphosis, anatomy, collecting and breeding of insects, identification and the control of injurious species.

There follows a brief account of the near relatives of insects, but confined in great part to spiders and their webs. The insects are divided into about twenty orders, of which the greater part of the text and a considerable number of the plates are devoted to the Hemiptera, Lepidoptera, Coleoptera, Diptera and Hymenoptera. While it is evidently intended that the figures should be used mainly for the identification of specimens, in the orders named there are analytical tables for the identification of families and genera and, in certain cases, species. The discussion of the Hymenoptera, the last order treated, is followed by a consideration of the abnormal growths or galls produced upon plants by insects. About the only way in which such structures can be identified is by the use of figures and the last seven plates contain figures of the common galls made by mites, Homoptera, Lepidoptera, Diptera and Hymenoptera. In interesting young people, those who tramp and camp, the student of

nature, and the farmer who observes the things about him, this book will prove of great value.

ALEX. D. MACGILLIVRAY

NOTES ON METEOROLOGY AND CLIMATOLOGY

RAINFALL OF THE UNITED STATES

MUCH progress has been made in accurate mapping of the rainfall of the United States, and in careful discussion of our now extensive records. In 1917, the Weather Bureau finished the construction of many maps designed to bring out the rainfall features of most importance in agriculture. Possibly by the end of this summer these will be published as a section of the Atlas of American Agriculture. In fact, the map of average annual precipitation has already appeared.¹

The most important of the unpublished maps are those of the monthly and seasonal rainfalls, and of the frequencies of rains of different intensities. Since the records of several thousand stations have been used, and since the isohyetal lines have been drawn with a careful consideration of topography, these maps show in much greater detail and accuracy than ever before the distribution of the rainfall of the United States.

The distribution has been ably discussed by Professor R. DeC. Ward.² The rainfall of the United States east of the Rockies seems to be from moisture originally coming from the Gulf of Mexico and the Atlantic Ocean; and, judging from the distribution of rainfall, the Gulf of Mexico is of primary importance. From the heavily watered north Gulf coast, where the rainfall is 60 inches a year, the amount decreases inland, slowly to the north, but rapidly to the northwest and west. East of the Appalachians the moisture from the Atlantic keeps the country well supplied—the rainfall being generally 45–50 inches in the south, and 40–45 in the north. The effect of the Appalachians is to increase the rainfall on the borders but to decrease the rain in the interior of the mountain region. Thus there

¹ See the reproduction in the *Mo. Weather Rev.*, July, 1917, Vol. 45, Pl. 76.

² *Ibid.*, pp. 338–345.